ORGANIC NERVOUS DISEASES

Practical Points In Their Diagnosis

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ORGANIC NERVOUS DISEASES

Practical Points In Their Diagnosis

NEUROLOGY is always, for some inscrutable reason, the bete noir of the medical student, and by a sort of "hang-over" from his student days the general practitioner appears to entertain a similar attitude of deference toward the subject of nervous diseases, especially the organic nervous diseases. He does not hesitate, as a rule, to say that "he does not understand nervous diseases very well," feels uneasy in their presence, distrusts his own diagnosis and judgment concerning them, and is greatly relieved when he can unshoulder the problem onto one who makes a specialty of this class of ailments.

Yet, for ordinary clinical purposes the organic nervous diseases offer no greater complexities or difficulties than any other group of disorders. Indeed, in some respects, they present a relatively easy and simple problem in diagnosis; for there is a certain definite constancy and logical orderliness about the manifestations of disorders of the nervous system such as are not met with in disturbances of any other part of the body. These manifestations are not hard to detect and demonstrate; with a very elemental knowledge of the gross anatomy and physiology of the nervous system they can be readily and correctly interpreted; and, in spite of the prevalent idea to the contrary, the signs and symptoms of nervous diseases do not deceive and mislead to anything like the extent that those of other disease-pictures do. Indeed, once established, they cannot and do not deceive or mislead at all. They have but one possible interpretation and significance.

Elemental Considerations

One has but to bear in mind a few very simple and elemental facts concerning the nervous system and its mechanism, and to apply them, in a most common-sense fashion, to the case in hand, to reach an equally simple and definite conclusion. These facts divide themselves into two groups:

1. The functions of the nervous system, which are three: (a) motion, (b) sensation, and (c) inhibition. There is another function, namely, the trophic function,—that is to say, the influence which the nerve exercises over the nutrition of the part it supplies,—but this function belongs to the sympathetic nervous system, and not properly to the cerebro-spinal system with which we are here dealing. It pertains to the cerebro-spinal system only in virtue of the admixture of some sympathetic fibers with certain cerebro-spinal nerve trunks, through their pre-vertebral ganglia; and as these ganglia and fibers are found only in connection with motor nerves, their trophic influence upon the muscles may be regarded, for clinical purposes, as part and parcel of the motor function of this class of nerves. It might, indeed, be well to hyphen the terms, and call the function of these nerves a motor-trophic function. Wherever there is trophic function in a muscle there is also motor function; wherever there is atrophy there is motor paralysis.

2. The topographical lay-out of the nervous system. In order to locate trouble in a telephone system it is not necessary to have a detailed knowledge of electronic chemistry; but the line inspector must have a general knowledge of the layout of his system of wires. If A, B, and C be three serial stations on the line, and a message can be transmitted from A to C, then it is clear that there is no trouble with any one of the stations, nor any break in the line between them. If it can be transmitted from A to B, but not from B to C, then it is plain that the trouble lies somewhere between B

and C. And so on. A very simple problem, if the general layout of the system be visualized, and certain landmarks on the system be charted.

In like manner, it is not necessary, in order to diagnose trouble in the nervous system, to have a minute knowledge of the histology of nerve-cells; all that is needed is a working knowledge of the general lay-out of the system, of a few important stations on the line, and of what takes place at these stations.

Nerve Functions

All of the functions of the cerebro-spinal nervous system are, in the last resort, functions of the brain. The rest of the system,—the spinal nerve paths, the peripheral nerve trunks, etc.,—are mere conducting wires, for the transmission of impulses to and from the brain. Sensations are registered in the brain; motion originates in the brain; and inhibition, or control, is performed by the brain. Unless, therefore, the paths between the peripheries (skin, muscles, organs, etc.) and the brain are open and uninterrupted, there cannot be normal sensation, motion and co-ordination.

Sensation and motion are transmitted to and from the brain, respectively, by two distinct and separate sets of nerves, and are therefore entirely independent of each other, physiologically, so that it is perfectly possible, and quite frequently the case, that sensation may be normal while motion is paralyzed, and *vice versa*. In certain locations, however, the motor and sensory nerves are so close to one another that it is clinically impossible to have an affection of the one without involving the other also. More of this later, when discussing the lay-out of the system.

Inhibition, or co-ordination, is as yet somewhat obscure as to its transmission. Whether it is transmitted from brain to muscle along the motor nerves, or by nerves of its own, is still in question. At all events, it travels by way of the

motor paths. But,—and here is a most important point, which seems especially hard for the ordinary practitioner to comprehend,—the brain performs its inhibitory function by means of the data brought to it by the sensory nerves; hence, even though the motor paths may be intact, and perfectly capable of carrying inhibitory currents, if the sensory paths be blocked there can be no normal inhibition or co-ordination. Thus, for example, in locomotor ataxia, which is purely a sensory disease, with no impairment whatever of motor power, and no atrophy of the muscles, the patient cannot stand or walk or do tasks with his hands, because the brain, lacking sensory data, cannot perform its "control" function.

Topography

In considering the lay-out of the nervous system, it is necessary to visualize only four general divisions of the system:

(a) The Brain, or Cortex,—the great receiving and sending station,—to which all the sensory paths go and from which all the motor and inhibitory paths start. Here the nerves from the various areas of the body, (face, tongue, arms, hands, legs, feet, etc.) are quite widely separated from each other. Those from the head and face are, respectively, on the same side of the brain as the body-areas which they supply; those from the trunk and limbs on the opposite side, crossing at the medulla oblongata.

(b) The Mid-Brain, or Capsule. Here the nerves, which in the cortex were widely separated, are bunched very closely together, sensory and motor nerves all passing through a channel not much, if any, larger than an ordinary lead-pencil. Those from and to the head and face are still on the same side of the brain, and those from the trunk and limbs on the opposite side (crossed).

(c) The Spinal Column. Here the motor and sensory nerves are separated into two distinct tracts or paths. Having crossed at the medulla, the nerves are on the same side of the cord as the body areas which they supply. The sensory nerves of one side, however, are so interlaced with those of the other side, that it is virtually impossible to have trouble with one side without involving the other. And the same is true of the motor tracts.

(d) The Peripheral (Spinal) Nerves. These are the nerve trunks which emerge from the spinal cord, and lie between the cord and the body-areas which they supply (muscles, skin, organs, etc.). Here, of course, the nerves supplying the various areas are again widely separated, even more widely than in the cortex, but,—another exceedingly important point,—the peripheral sensory and motor nerves travel together in the same sheath, so that it is impossible to have trouble with the sensory nerves in this location without equally involving the motor, and vice versa.

Two more important facts complete this topographical picture:

(a) The nerve tracts between the brain and the spinal cord form one distinct set of neurones, sensory and motor, known as the upper neurones. Those which lie between the spinal cord and the peripheries, sensory and motor, form another set known as the lower neurones. Impulses going to the brain (sensory) or coming from the brain (motor) are relayed from one set to the other as telephone messages are relayed from one set of wires to another.

(b) The sympathetic (trophic) nerves, which govern the nutrition of the muscles, join the lower motor neurones just as they emerge from the spinal cord.

Diagnostic Deductions

Certain definite diagnostic conclusions follow inevitably from the foregoing conditions:

1. Since sensation is the function of the sensory nerves,

irritation of these paths produces pain, and destruction or interruption of their function produces anesthesia.

2. Since motion is the function of the motor nerves, irritation of these paths produces twitching and jerking, destruction or interruption produces motor paralysis.

3. Since co-ordination is furnished by the sensory tracts and is transmitted by the motor tracts, interruption of either sensory or motor paths produces incoordination. Interruption of the sensory paths alone can produce incoordination, but not interruption of the motor paths alone.

4. Neural pain indicates irritation of the sensory path somewhere between the painful area and the brain. Since pain cannot originate in the brain, the irritation is either in the peripheral nerves or in the spinal cord.

5. Anesthesia indicates a break (disease) in the sensory path somewhere between the anesthetic area and the brain.

6. Twitching or jerking of a muscle indicates irritation somewhere in the motor path between the affected muscle and the brain. It can, and frequently does, originate in the cortex.

7. Motor paralysis indicates a break (disease) in the motor path somewhere between the paralyzed muscle and the brain. It, also, can and often does originate in the brain itself.

8. Paralysis and anesthesia combined, in the same area, indicates a disease of the peripheral nerves, since the sensory and motor nerves here travel in the same sheath.

9. Paralysis of a single part of the body (foot, hand, tongue, side of face, etc.) indicates a lesion of the cortex since it is in the cortex that the motor nerves supplying these parts are separated into single centres.

10. Paralysis of one-half of the body (hemiplegia), or one side of the body and the opposite side of the face (crossed hemiplegia) indicates a lesion in the mid-brain capsule.

11. Bilateral, symmetrical paralysis, of both sides of the body below a certain level, indicates a lesion in the spinal cord.

12. Motor paralysis with rapid atrophy of the muscle indicates a lesion below the point where the sympathetic fibres join the motor nerve, i. e., either in the peripheral motor nerve, or at the spinal root (anterior horn) where the junction ganglion is. A motor lesion above that point would produce paralysis, but would not interfere with the trophic influence of the sympathetic.

13. Complete anesthesia almost always indicates a disease of the peripheral nerves, because the sensory paths in the spinal cord are so numerous and interlaced that spinal disease seldom produces a complete block of sensory impulses. Peripheral anesthesia is, of course, always accompanied by motor paralysis (See par. 8.).

14. Incoordination with either anesthesia nor motor paralysis indicates a disease of that part of the brain which is not concerned with the sensory or the motor functions, i. e., not the cortex, but probably the cerebellum.

The Reflexes

The foregoing "fourteen points" furnish, in themselves, almost enough data upon which to base a general neuronic diagnosis of an organic nerve disease, without any objective examination of the patient at all, other than to ascertain the conditions of anesthesia and motor paralysis. There is, however, a set of objective tests, well within the capacity of every practitioner, and requiring no special equipment, (although an inexpensive percussor is advisable), which, supplementing the points above outlined, will serve to complete the neuronic diagnosis, so far as the needs of the practitioner go. The term "neuronic diagnosis" is here employed because, of course, there is nothing whatever in

neurological diagnosis to indicate what is the etiology and nature of the disease process which is attacking the nervous system. That part of the diagnosis does not pertain to neurology at all, but to general diagnostics, and is to be arrived at by precisely the same means as any other form of disease.

The additional set of tests referred to consists of what are technically known as the reflexes. They depend upon the joint phenomena of the tonal influence of the spinal cord and the inhibitory action of the brain. Normally, the cord pours continually into the muscles, through the lower motor neurons, a certain amount of nerve energy, sufficient to keep them in a state of "tone." The inhibitory action of the brain, exercised by way of the upper motor neurones, prevents this outflow of tonal energy from the cord being excessive. It follows, naturally, that in the event of a break in the motor path between the cord and the muscle (i. e., in the peripheral nerves) no tonal energy reaches the muscle, and it loses its tone and becomes flaccid. If, on the other hand, there is a break, either in the sensory paths (where inhibition originates) or in the upper motor neurones (which transmit inhibition), then the muscles receive excessive tonal energy, and become spastic and even contracted.

These possible conditions of "tone" in the muscles are ascertained by means of "reflex" tests. Proper stimuli are applied to certain sensory areas,—skin, tendons, etc.—to which involuntary, or practically involuntary, motor responses are made through the spinal cord, the whole circuit, —the sensory impulse, the transference of the impulse at the spinal arc, and the responding motor impulse,—being known as a reflex.

If the motor response is normal, then the state of tone is normal, indicating the integrity of the entire sensory, motor and brain path above the level where the reflex is tested.

If the motor response is excessive, then inhibition is lacking, indicating a break somewhere, either in the sensory paths or in the upper motor neurones, but not in the lower motor neurones, else tonal energy could not reach the muscle at all.

If, lastly, the motor response is very weak, or absent altogether, the muscle is not receiving its proper degree of tonal energy from the cord, indicating a break between the cord and the muscle, i. e., in the lower motor neurones.

Translating these findings into terms of the reflex, then:

A normal reflex indicates the integrity of the entire nervous system above the level of the test.

An exaggerated reflex indicates a disease of the brain or of the spinal paths higher up than the spinal roots or horns.

A diminished or absent reflex indicates a disease of the lower motor neurones, either between cord and muscle, or in the anterior roots themselves.

Comparing the reflex findings with the items of the "fourteen points" which apply to the case in hand, a conclusive and fairly complete conclusion can be drawn as to the neurotic diagnosis.

Special Reflexes

Naturally, the reflexes whose arcs are lowest down in the spinal cord are the most commonly used for diagnostic purposes, as they indicate the largest extent of nerve condition above the arc. Below will be found a description of the more important special reflexes, the method of their elicitation, and their significance. Of these, the plantar, the tendon Achilles and the patellar are the most commonly used, because they are the most easily elicited and the most constant in their reaction.

The Plantar Reflex. This is elicited by stroking the sole of the foot, to which the normal response is a flexing of the toes. In case of a lesion of the upper neurones (no inhibition) the large toe is extended. Or the big toe may be extended and the rest flexed. Of itself, this reflex is of no particular clinical value, because of the normal variation exhibited by different individuals in their reaction to the stimulus, some persons hardly responding at all, while others are thrown almost into convulsions by the slightest touch.

Babinski's Phenomenon is a modification, and an important one, of the plantar reflex. It consists of an extensor response on the part of all the toes, like a fan. This is normal in infants, due to the lack of cortical control (inhibition), the brain function not yet having developed. In adults, however, it points to a pathologic return to this infantile condition, i. e., a cut-off of cortical control; in other words, a lesion of the upper motor neurones, preventing inhibition. It is one of the most valuable, trustworthy, constant and early tests we have. If positive, it is an unfailing indication of upper neurone motor trouble, either in the brain or in the upper spinal cord.

Ankle Clonus. This reaction is less constant, but valuable when it can be elicited. It consists in putting the tendon Achillis suddenly and violently on the stretch by quickly and forcibly extending it on the ankle, and then releasing it. If the inhibition of the brain is lacking, the exaggerated reflex will show itself in a vigorous rhythmic vibration of the foot. If positive, therefore, the sign indicates an upper neurone lesion. It has no negative value. It is not as trustworthy as the Babinski, because it can be, and is, readily simulated in hysteria and like conditions.

Patellar Reflex. This is the most commonly used and trustworthy of all the purely tendon reflexes. There is,

indeed, some question as to whether it is a genuine reflex, or merely the elastic rebound of the tendon itself. Practically, however, this is immaterial, because, even if it be the latter, still its behavior depends upon the tonal influence of the cord. And it is sufficiently low down in the cord to serve most practical purposes. The normal knee jerk, i. e., neither exaggerated nor diminished, indicates integrity of both sensory and motor neurones of the arc and spinal tracts from the third lumbar segment up to the brain, and including the brain itself. Thus a normal knee-jerk practically assures integrity of the entire spinal tract, as far up and down as any disease is likely to affect it.

Exaggeration of the knee-jerk indicates an interruption of one or more of the ascending (sensory) tracts between the third lumbar segment and the brain, cutting off the inhibitory data from the brain; or of the upper motor neurones (brain or upper cord) interrupting transmission of inhibitory impulses. This reaction is seen, for example, in multiple sclerosis, where the motor tracts are studded with nodules; in amyotrophic lateral sclerosis, where the lateral motor tracts are degenerated; in cerebellar disease, where the coordinating influence of the cerebellum is impaired; and in all brain lesions. Purely central myelitis also gives this symptom, because it involves the upper and not the lower neurones of the cord.

Absence or diminution of the knee-jerk indicates interruption of the motor or sensory neurones of the lower level, or disease of the posterior part of the cord, including destruction of the arc. The knee-jerk is abolished or lessened in neuritis and progressive muscular atrophy, because of the degeneration of the lower neurones; in tabes, because of the degeneration of the posterior tracts and arcs of the cord; in diffuse myelitis, because the roots of the lower neurones in the cord are involved, cutting off the tonal energy. In

these spinal diseases a careful examination of the various reflexes whose arcs are at different levels will indicate the upward limit to which the degenerative process extends.

Pupillary Reflexes. The response of the muscles of the iris to light stimulus furnishes a distinct group of reflex phenomena which play an important part and give useful information in diseases of the nervous system.

Dilation of the Pupil. This is really a muscular reflex, due to the dominance of the radiating muscles, when inhibition is lacking. It is seen in tumors of the brain, coma, hemiasthenia, and depressive neuroses, meningitis, etc.

Contraction of the Pupil. Precisely the opposite of the foregoing, due to dominance of the concentric muscles of the iris, when there is irritation of the third nerve. It is seen in brain compressions, coma, opium poisoning, etc.

The Argyll Robertson Pupil. When light is thrown into the pupil, it normally responds by sharply and vigorously contracting. When this does not take place, but the pupil contracts upon accommodating, we have what is known as the Argyll Robertson pupil, whose precise mechanism is obscure. It is seen in all spinal diseases which impair the sensory tracts, especially the cervical portion, such as chronic myelitis, tabes dorsalis (locomotor ataxia), and sclerosis, and in certain cerebral diseases, notably in dementia paralytica, supposed to be due to involvement of Meinert's fibres.

Hippus. A periodic and visible contraction and expansion of the pupil, due to alternate excitation and inhibition. It is seen in disorders affecting the emotions, and is rather an indication that the condition is *not* an organic nerve disease.

Classification of Diseases

Most of the confusion and the fancied difficulty which attends the diagnosis of organic nerve diseases is due to the attempt on the part of the practitioner to affix a specific label to the case in hand. Inasmuch as a large percentage of cases represent a mixture of conditions, both as to pathology and as to distribution, such a cut-and-dried "labeling" is manifestly impossible. It is far better that the physician should think in terms of the conditions themselves and the portions of the nervous system which are involved.

Broadly speaking, the pathologic conditions which come under the heading of organic nerve diseases may be considered in three groups:

1. Those diseases which, strictly speaking, are not diseases of the nerve tissues themselves, but which affect primarily the serous lining of the nerve sheath or canal, and are known as meningites. Practically all of this class of diseases are of the acute infectious type, and they have this common pathologic and symptomatic picture: First, an intense inflammation and roughening of the meningeal membrane, which greatly irritates the entire neurone content, sensory and motor, producing violent pain and spastic rigidity of the muscles involved; later, a profuse outpouring of serum (and perhaps pus) into the restricted cavities of the canal, causing compression paralysis and anesthesia, with flaccid muscles, and usually resulting in more or less permanent destruction of nerve tissue.

If the brain meninges are involved, the first stage is marked by violent headache and delirium, the second by stupor and coma. If the spinal meninges are attacked, the first stage is characterized by intense, agonizing limb pains, the second by flaccid paralysis. As a matter of fact, meningitis, whatever its etiology, is rarely altogether cerebral, or altogether

spinal, but almost always a mixture of the two, in which, perhaps, one or other type predominates. It is, of course, always attended by the signs and symptoms common to all acute infections,—high temperature, rapid pulse, toxicity, etc. The characteristic feature of the neurotic symptomatology is its irregularity; the pain, and later the paralysis, being without symmetry or order; reflexes often being exaggerated at one point and absent at another, because of the irregular march of the pathology; and the nature and severity of the condition shifting from day to day as the pathological conditions shift.

In spite of this inconstancy and shifting, however, meningitis is unmistakable, because, irregular though they may be, all the neuronic signs of nerve involvement are, at some time and in some distribution, present,—pain, twitching, rigidity, paralysis, and altered reflexes.

2. Acute inflammatory diseases of the nerve tissues themselves, which may be classed under the general heading of acute myelitis. By far the commonest example is the well-known acute anterior poliomyelitis, which attacks the anterior horns of the lower motor neurones, especially in children. The pathology and symptomatology is much the same as in the meningites,—first, acute irritation, giving rise to violent pain and jactitation, followed by effusion, compression paralysis, and destruction of nerve tissue, which is usually much greater than in meningitis, because of the more interstitial nature of the effusion and compression.

As with meningitis, the characteristic feature of the neuronic conditions in acute poliomyelitis is their irregularity. It is, indeed, often admixed with meningitis. In common with all acute infectious diseases, poliomyelitis is at first

attended with high temperature, rapid pulse, headache, toxicity, and all the symptoms of bacterial invasion.

In truth, the neuronic significance of these two classes of disease is not in the *nice differentiation* of the neuronic symptoms, but in the *recognition of their presence.* Both the meningites and the myelites are violent, acute infections, and have to be differentiated from all other violent, acute infections. Their diagnosis lies in the demonstration of neuronic changes,—muscle rigidities, paralysis, and altered reflexes,—no matter how irregularly or even apparently paradoxically these may manifest themselves. These changes do not occur at all in the other, non-nervous infections.

3. Non-inflammatory degenerations of true nerve tissue. These constitute by far the greater proportion of true organic nerve diseases, especially among adults, and require nice differentiation. They may occur rapidly, even suddenly, as in the case of embolism and thrombosis, more slowly, as in brain abscesses, tumors, syphilis, etc., or still more gradually, as in chronic myelitis, locomotor ataxia, lateral amyotrophic sclerosis, multiple neuritis, etc. But the essential pathology is the same in every case, namely, a cutting off of the continuity of the neurone path, sensory or motor or both, in the brain, the spinal cord, or the peripheral nerves, with a resulting anesthesia or paralysis, as the case may be, possible incoordination, and an exaggeration or diminution of the reflexes.

In all of this class of diseases the "fourteen points" and the reflex tests must be applied, as indicated above, in order to arrive at a diagnosis of a cerebral, spinal or peripheral condition, which is here important to the prognosis and management of the disease.

Having located the lesion, its nature and etiology must be determined by the same diagnostic means that are employed in any other case. If, for example, the neuronic tests show the lesion to be in the brain, an abscess must be differentiated by the blood-count, thrombosis by the general state of the cardiovascular system, embolism by the suddenness and violence of the onset, syphilitic gumma by the Wassermann test, and so on. If the lesion has been located in the spinal cord, or in the lower neurones, the differentiation usually lies between syphilis and some unknown infectious factor, which is determined by the Wassermann test and such other evidence as is usually invoked in the presence of suspected syphilis.

It may be repeated, however, that extreme refinement of diagnosis in organic nervous disease is neither possible nor required of the general practitioner. When that point is reached, a nerve specialist will be called in consultation anyway. The important thing is for the physician to be able (1) to recognize the presence of an organic disease of the central nervous system and its nature, and (2) to determine its approximate location in the cerebro-spinal tract. The latter point is of great importance, because the prognosis, and the course to be pursued, differ so greatly in diseases of the brain, the cord, and the peripheral nerves, respectively.

General Management

It is not the purpose of this little booklet to deal with the treatment of organic nervous diseases, its object being limited to giving a brief, concise summary of the principles and methods of diagnosis. However, we may take the time

and space to say that, so far as the general management of this class of diseases is concerned, it resolves itself chiefly into the treatment of general and focal infection (for practically all organic nervous diseases are the result of infection) and the control of pain. To this may be added, in the case of the chronic degenerative diseases, resorbent treatment for the removal of fibrosis and other deposits.

For the first of these therapeutic purposes, the treatment of the underlying infection, the indications are the same, whether the disease be acute or chronic, except that in the former case the infection has to be attacked vigorously, while in the chronic cases it is better to give milder and longer continued treatment. Bacterins, and even surgery (in the case of focal infections), may be called to our aid in this work, but, whatever other measures may be used, a course of ECTHOL, in large doses, frequently repeated, in acute cases, in smaller and widelier separated doses in chronic cases, will be found to exercise a marked and gratifying effect upon the sepsis that underlies the nervous disease.

The measures to be employed for the relief of pain differ with the circumstances of the case, and call for nice judgment. In a general way it may be said that in the acute forms of nervous disease—meningitis, poliomyelitis, acute neuritis, etc.—where the pain is very violent and the duration relatively short, an opiate is usually both necessary and justifiable. Especially is it justifiable when we have at our disposal an agent like PAPINE, which permits us to obtain all of the powerful analgesic effects of opium, with none of those untoward side-effects that make us so chary of morphine. In the chronic nervous diseases, where the

pain, as a rule, is not so intense, but where we have to deal, in addition with the patient's neurotic condition, over a long period—possibly the remainder of his life—it is usually possible to obtain all the necessary sedation by means of the judicious use of BROMIDIA. This does not, as a rule, need to be given continuously and routinely. Indeed, if that is done, the effectiveness of the remedy becomes weakened. It should be given, in appropriate doses, as may be required to cope with the patient's intolerance of his pain and with his restlessness.

All victims of acute organic nervous diseases, when they reach the stage of convalescence, and all patients with chronic diseases of the nervous system, should receive a thorough and long-continued course of IODIA, which furnishes them with precisely the resorbent and reconstructive elements they need to clear their system of the products of infection and rebuild their wasted tissues.

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